WHAT IS CLAIMED IS:

1. A method for detecting the presence or quantity of an analyte residing in a test sample, said method comprising:

i) providing a lateral flow assay device that comprises a porous membrane in fluid communication with detection probes, said detection probes comprising a phosphorescent label encapsulated within a matrix, wherein said porous membrane defines a detection zone within which is immobilized a capture reagent that is configured to bind to said detection probes or complexes thereof;

ii) contacting said detection probes with the test sample;

iii) allowing said detection probes and the test sample to flow to said detection zone;

iv) exciting said phosphorescent label at said detection zone to generate an emitted detection signal; and

v) measuring the intensity of the detection signal, wherein the amount of the analyte within the test sample is proportional to the intensity of the detection signal.

2. A method as defined in claim 1, wherein said phosphorescent label comprises a metal complex.

3. A method as defined in claim 2, wherein said metal complex comprises a metal selected from the group consisting of ruthenium, osmium, rhenium, iridium, rhodium, platinum, indium, palladium, molybdenum, technetium, copper, iron, chromium, tungsten, zinc, and combinations thereof.

4. A method as defined in claim 2, wherein said metal complex comprises a metal selected from the group consisting of ruthenium, osmium, rhenium, platinum, palladium, and combinations thereof.

5. A method as defined in claim 2, wherein said metal complex comprises a ligand selected from the group consisting of pyridine, pyrazine, isonicotinamide, imidazole, bipyridine, terpyridine, phenanthroline, dipyridophenazine, porphyrin, porphine, derivatives thereof, and combinations thereof.

6. A method as defined in claim 2, wherein said phosphorescent label comprises a porphyrin ligand, porphine ligand, derivatives thereof, or combinations thereof.

7. A method as defined in claim 6, wherein said phosphorescent label is selected from the group consisting of platinum (II) coproporphyrin-I and III,

palladium (II) coproporphyrin, ruthenium coproporphyrin, zinc(II)-coproporphyrin-I, platinum(II) tetra-meso-fluorophenylporphine, palladium(II) tetra-meso-fluorophenylporphine, derivatives thereof, and combinations thereof.

8. A method as defined in claim 2, wherein said phosphorescent label comprises a bipyridine ligand or derivatives thereof.

9. A method as defined in claim 1, wherein said matrix comprises metal oxide particles, polymer particles, or combinations thereof.

10. A method as defined in claim 9, wherein said particles have an average size of from about 0.1 nanometers to about 1000 microns.

11. A method as defined in claim 9, wherein said particles have an average size of from about 0.1 nanometers to about 100 microns.

12. A method as defined in claim 9, wherein said particles have an average size of from about 1 nanometer to about 10 microns.

13. A method as defined in claim 1, wherein said matrix acts as a barrier to protect said phosphorescent label from quenching.

14. A method as defined in claim 13, wherein less than about 30% of the detection signal is quenched when said detection probes are exposed to a quencher.

15. A method as defined in claim 13, wherein less than about 20% of the detection signal is quenched when said detection probes exposed to a quencher.

16. A method as defined in claim 13, wherein less than about 10% of the detection signal is quenched when said detection probes are exposed to a quencher.

17. A method as defined in claim 1, wherein said phosphorescent label has a phosphorescence emission lifetime of greater than about 1 microsecond.

18. A method as defined in claim 1, wherein said phosphorescent label has an emission lifetime of greater than about 10 microseconds.

19. A method as defined in claim 1, wherein said phosphorescent label has an emission lifetime of from about 100 to about 1000 microseconds.

20. A method as defined in claim 1, wherein said capture reagent is selected from the group consisting of antigens, haptens, protein A or G, neutravidin, avidin, streptavidin, captavidin, primary or secondary antibodies, and complexes thereof.

21. A method as defined in claim 1, wherein said phosphorescent label is excited at said detection zone with a pulsed excitation source and said emitted detection signal is measured by a time-gated detector.

22. A method as defined in claim 1, wherein said porous membrane further defines a calibration zone within which a capture reagent is immobilized that is configured to bind to said detection probes or calibration probes that also comprise a phosphorescent label.

23. A method as defined in claim 22, further comprising exciting said phosphorescent label at said calibration zone to generate an emitted calibration signal, and measuring the intensity of the calibration signal, wherein the amount of the analyte within the test sample is proportional to the intensity of the detection signal calibrated by the intensity of the calibration signal.

24. A method as defined in claim 1, wherein said detection probes are conjugated with a specific binding member for the analyte.

25. A method as defined in claim 24, wherein said specific binding member is selected from the group consisting of antigens, haptens, aptamers, primary or secondary antibodies, biotin, and combinations thereof.

26. A method as defined in claim 1, wherein said assay device is a sandwich-type assay device.

27. A method as defined in claim 1, wherein said assay device is a competitive-type assay device.

28. A method for detecting the presence or quantity of an analyte residing in a test sample, said method comprising:

i) providing a lateral flow assay device that comprises a porous membrane in fluid communication with detection probes, said detection probes comprising a phosphorescent metal complex encapsulated within a particle matrix, said phosphorescent metal complex comprising a ligand and a metal selected from the group consisting of ruthenium, rhenium, osmium, platinum, palladium, and combinations thereof, said phosphorescent metal complex having a phosphorescence emission lifetime of greater than about 1 microsecond, wherein said porous membrane defines a detection zone within which is immobilized a capture reagent configured to bind to complexes of said detection probes;

ii) contacting said detection probes with the test sample;

iii) allowing said detection probes and the test sample to flow to said detection zone;

iv) exciting said phosphorescent metal complex at said detection zone to generate an emitted detection signal; and

v) measuring the intensity of the detection signal, wherein the amount of the analyte within the test sample is proportional to the intensity of the detection signal.

29. A method as defined in claim 28, wherein said metal complex comprises a ligand selected from the group consisting of pyridine, pyrazine, isonicotinamide, imidazole, bipyridine, terpyridine, phenanthroline, dipyridophenazine, porphyrin, porphine, derivatives thereof, and combinations thereof.

30. A method as defined in claim 28, wherein said ligand comprises porphyrin, porphine, derivatives thereof, or combinations thereof.

31. A method as defined in claim 30, wherein said phosphorescent metal complex is selected from the group consisting of platinum (II) coproporphyrin-I and III, palladium (II) coproporphyrin, ruthenium coproporphyrin, platinum(II) tetra-meso-fluorophenylporphine, palladium(II) tetra-meso-fluorophenylporphine, derivatives thereof, and combinations thereof.

32. A method as defined in claim 28, wherein said ligand comprises bipyridine or derivatives thereof.

33. A method as defined in claim 28, wherein said particle matrix comprises metal oxide particles, polymer particles, or combinations thereof.

34. A method as defined in claim 33, wherein said particles have an average size of from about 0.1 nanometers to about 100 microns.

35. A method as defined in claim 28, wherein said particle matrix acts as a barrier to protect said phosphorescent metal complex from quenching.

36. A method as defined in claim 28, wherein less than about 30% of the detection signal is quenched when said detection probes are exposed to a quencher.

37. A method as defined in claim 28, wherein less than about 20% of the detection signal is quenched when said detection probes are exposed to a quencher.

38. A method as defined in claim 28, wherein less than about 10% of the

detection signal is quenched when said detection probes are exposed to a quencher.

39. A method as defined in claim 28, wherein said phosphorescent metal complex has an emission lifetime of greater than about 10 microseconds.

40. A method as defined in claim 28, wherein said phosphorescent metal complex is excited at said detection zone with a pulsed excitation source and said emitted detection signal is measured by a time-gated detector.

41. A method as defined in claim 28, wherein said porous membrane further defines a calibration zone within which a capture reagent is immobilized that is configured to bind to said detection probes or calibration probes that also comprise a phosphorescent metal complex.

42. A method as defined in claim 41, further comprising exciting said phosphorescent metal complex at said calibration zone to generate an emitted calibration signal, and measuring the intensity of the calibration signal, wherein the amount of the analyte within the test sample is proportional to the intensity of the detection signal calibrated by the intensity of the calibration signal.

43. A method as defined in claim 28, wherein said detection probes are conjugated with a specific binding member for the analyte.

44. A lateral flow assay device for detecting the presence or quantity of an analyte residing in a test sample, said assay device comprising a porous membrane in fluid communication with detection probes, said detection probes comprising a phosphorescent metal complex encapsulated within a matrix, wherein said porous membrane defines a detection zone within which a capture reagent is immobilized that is configured to bind to said detection probes or complexes thereof to generate a detection signal, wherein the amount of the analyte in the test sample is proportional to the intensity of said detection signal.

45. A lateral flow assay device as defined in claim 44, wherein said metal complex comprises a metal selected from the group consisting of ruthenium, osmium, rhenium, platinum, palladium, and combinations thereof.

46. A lateral flow assay device as defined in claim 44, wherein said metal complex comprises a ligand selected from the group consisting of pyridine, pyrazine, isonicotinamide, imidazole, bipyridine, terpyridine, phenanthroline, dipyridophenazine, porphyrin, porphine, derivatives thereof, and combinations

thereof.

47. A lateral flow assay device as defined in claim 46, wherein said ligand is porphyrin, porphine, derivatives thereof, or combinations thereof.

48. A lateral flow assay device as defined in claim 47, wherein said phosphorescent metal complex is selected from the group consisting of platinum (II) coproporphyrin-I and III, palladium (II) coproporphyrin, ruthenium coproporphyrin, zinc(II)-coproporphyrin-I, platinum(II) tetra-meso-fluorophenylporphine, palladium(II) tetra-meso-fluorophenylporphine, derivatives thereof, and combinations thereof.

49. A lateral flow assay device as defined in claim 46, wherein said ligand is bipyridine or derivatives thereof.

50. A lateral flow assay device as defined in claim 44, wherein said matrix comprises metal oxide particles, polymer particles, or combinations thereof.

51. A lateral flow assay device as defined in claim 50, wherein said particles have an average size of from about 0.1 nanometers to about 1000 microns.

52. A lateral flow assay device as defined in claim 50, wherein said particles have an average size of from about 0.1 nanometers to about 100 microns.

53. A lateral flow assay device as defined in claim 50, wherein said particles have an average size of from about 1 nanometer to about 10 microns.

54. A lateral flow assay device as defined in claim 44, wherein said matrix acts as a barrier to protect said phosphorescent metal complex from quenching.

55. A lateral flow assay device as defined in claim 54, wherein less than about 30% of the detection signal is quenched when said detection probes are exposed to a quencher.

56. A lateral flow assay device as defined in claim 54, wherein less than about 20% of the detection signal is quenched when said detection probes are exposed to a quencher.

57. A lateral flow assay device as defined in claim 54, wherein less than about 10% of the detection signal is quenched when said detection probes are exposed to a quencher.

58. A lateral flow assay device as defined in claim 44, wherein said

phosphorescent metal complex has an emission lifetime of greater than about 10 microseconds.

59. A lateral flow assay device as defined in claim 44, wherein said capture reagent is selected from the group consisting of antigens, haptens, protein A or G, neutravidin, avidin, streptavidin, captavidin, primary or secondary antibodies, and complexes thereof.

60. A lateral flow assay device as defined in claim 44, wherein said detection probes are conjugated with a specific binding member for the analyte.

61. A lateral flow assay device as defined in claim 44, wherein said porous membrane further defines a calibration zone within which a capture reagent is immobilized that is configured to bind to said detection probes or calibration probes that also comprise a phosphorescent metal complex, wherein the amount of the analyte within the test sample is proportional to the intensity of the detection signal calibrated by the intensity of the calibration signal.

62. A lateral flow assay device as defined in claim 44, wherein said assay device is a sandwich-type assay device.

63. A lateral flow assay device as defined in claim 44, wherein said assay device is a competitive-type assay device.